

Central Maine Power Company/)	Departmental
Kittery Substation Diesel Unit)	Findings of Fact and Order
York County)	Air Emission License
Kittery, Maine)	
A-883-71-A-N (SM))	

After review of the air emissions license application, staff investigation reports and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 M.R.S.A., Section 344 and Section 590, the Department finds the following facts:

I. REGISTRATION

A. Introduction

Central Maine Power Company has applied for a new license for a diesel generation unit at the Kittery Substation. The diesel unit is rated at 19 MMBtu/hr and is expected to operate only when voltage support is needed during peak electric demand periods while construction occurs to upgrade the area lines. The term of this license is to be for one year.

B. Emission Equipment

The following equipment is addressed in this air emission license:

Fuel Burning Equipment

<u>Equipment</u>	<u>Maximum Capacity (MMBtu/hr)</u>	<u>Maximum Firing Rate (gal/hr)</u>	<u>Fuel Type, max. % sulfur</u>
Diesel Engine	19	135.8	Diesel, 0.05% sulfur

C. Application Classification

A new source is considered a major source based on whether or not expected emissions exceed the "Significant Emission Levels" as defined in Chapter 100 of the Department's regulations. The emissions for the diesel unit are determined by the maximum future license allowed emissions, as follows:

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<u>Pollutant</u>	<u>Max. Future Licensed Allowed (TPY)</u>	<u>Sig. Level</u>
PM	0.2	100
PM ₁₀	0.2	100
SO ₂	0.5	100
NO _x	28.8	100
CO	0.6	100
VOC	0.5	50

The maximum future licensed allowed limit was based upon a 136,000 gallons/year fuel cap.

The air emission license for the Kittery Substation diesel unit is determined to be a minor new source license and has been processed as such. The fuel cap limits facility emissions to below the major source tons per year threshold, therefore the Kittery Substation licensed diesel unit facility is considered to be a synthetic minor.

II. BEST PRACTICAL TREATMENT (BPT)

A. Introduction

In order to receive a license the applicant must control emissions from each unit to a level considered by the Department to represent Best Practical Treatment (BPT), as defined in Chapter 100 of the Department's regulations. Separate control requirement categories exist for new and existing equipment as well as for those sources located in designated non-attainment areas.

BPT for new sources and modifications requires a demonstration that emissions are receiving Best Available Control Technology (BACT), as defined in Chapter 100 of the Department's regulations. BACT is a top-down approach to selecting air emission controls considering economic, environmental and energy impacts.

B. Diesel Engine

The proposed Caterpillar diesel-fired internal combustion engine generator set is rated at 19 MMBtu/hr (135.8 gallons/hr). The generator set is trailer-mounted and self contained with an integral fuel tank. The engine is a four-stroke cycle and will fire fuel with a maximum sulfur content of 0.05%. Emissions will exhaust through a 13 feet above ground level stack.

The diesel engine will be used, if needed, to provide voltage support in the area during construction in spring/summer of 2004. The total construction project includes upgrading and rebuilding an existing substation, construction of two new substations, and the construction of new transmission line. The diesel engine will ensure that adequate voltage is available for the distribution circuits before and during the high-demand warmer season and prior to the completion of the transmission line loop. Actual usage of the diesel engine will depend on the transmission line construction schedule and electricity demand during the construction period.

Central Maine Power submitted a BACT analysis for the diesel engine at the Kittery Substation, addressing units found in EPA's RACT/BACT/LAER Clearinghouse, units licensed in Maine, and the technical and economic feasibility of those units. The following summarizes the BACT analysis for the diesel engine:

[It should be noted that a propane-fired engine was considered but the propane-fired unit takes up more space than the diesel-fired unit (twice as much) and would need an additional area for a fuel tank. A natural gas unit or propane gas unit works best when base loaded. The operation at Kittery Substation will require operational flexibility and therefore only diesel units were considered.]

PM/PM₁₀ – Particulate matter can be emitted in several different forms from diesel units. PM can be exhausted as liquid particles (white smoke) during cold startups, idling, or low operation. Lubricating oil can leak into the combustion chamber and become partially burned, creating blue smoke. Soot (black smoke) is made up of a mass of carbon particles. Minimization of smoke emissions can occur with proper maintenance and operation of the engine.

Add-on controls were reviewed for further reduction of particulate matter, including a diesel oxidation catalyst. However, the flow rate from the proposed diesel unit would require 7 or 8 catalyst units in parallel, costing over \$50,000. Based upon the small additional amount of particulate matter reduction with control, the add-on alternative is not economically feasible.

Many of the diesel units reviewed used good combustion practices and a fuel or hourly limit for control of particulate matter emissions.

BACT for PM/PM₁₀ from the Kittery Substation diesel unit is determined to be the use of the Caterpillar Advanced Diesel Engine Management (ADEM) system, a fuel use limit of 136,000 gallons per year, and PM emission limits

of 0.47 lb/hr and 0.2 tons per year. The ADEM system consists of the main electronic control module, control software, sensors, actuators, fuel injectors, and interface to the generator system. The 0.47 lb/hr limit is below the 0.12 lb/MMBtu requirement in Chapter 103 of the Department's regulations (Fuel Burning Equipment Particulate Emission Standard).

SO₂ – Control technologies are available for the control of sulfur dioxide, but for internal combustion engines these technologies are not economically feasible. The most effective and most widely used control for SO₂ from diesel units is limiting the sulfur in the fuel.

BACT for SO₂ from the Kittery Substation diesel unit is determined to be the use of fuel oil that will not exceed 0.05% sulfur content, a fuel limit of 136,000 gallons per year, and SO₂ emission limits of 0.94 lb/hr and 0.5 tons per year.

NO_x – Nitrogen oxides can form through thermal reactions of the nitrogen and oxygen in the combustion air and also from the nitrogen in the fuel. Most NO_x from internal combustion engines come from thermal NO_x. Two add-on controls for NO_x include selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR).

SCR is technically feasible for internal combustion engines, however SCR operation is dependent on catalyst reactor design, optimum operating temperature, sulfur content of the fuel, and design of the ammonia (NH₃) injection system. Several facilities in Maine were licensed with SCR on engines, but these facilities either are licensed for continuous engine operation, have allowable emissions greater than the proposed 28.8 tons per year, and/or are licensed for greater than one year. In addition, there are some potential environmental impacts with using SCR, including ammonia slip, safety issues, and disposal of the spent catalyst. Renting an SCR unit was considered for this project, but the vendors required the total cost of the unit to be recouped within the rental period. A quote included in the application was \$200,000 (capital). If the SCR system controls 80% of the emissions, then without even considering operating costs and based on one year use, the cost of NO_x removal is \$8,700 per ton. This cost shows that the SCR installation is economically infeasible for the Kittery Substation.

SNCR is not widely used on diesel engines, but there is a non-catalytic surface technology available to reduce NO_x emissions and it's manufactured by NO_xTECH. The NO_xTECH system reduces emissions autocatalytically using only gas-phase reactions. NO_x is reduced by injecting ammonia or urea and the gas-phase autocatalysis is self-sustained autothermally by fuel combustion

in the exhaust gas. Supplemental fuel is used to maintain a specific temperature and the extra heat released is recovered for continued temperature control. NO_xTECH is technically feasible, although it operates efficiently only in a limited temperature range. The potential environmental impacts with using NO_xTECH include ammonia slip, safety issues, and additional fuel burning byproducts if the correct parameters are not maintained. A quote included in the application was \$250,000 for capital. If the NO_xTECH system controls 90% of the emissions, then without even considering operating costs and based on one year use, the cost of NO_x removal is \$9,600 per ton. This cost shows that the NO_xTECH installation is economically infeasible for the Kittery Substation.

Ignition timing retard has been used as BACT on older model generator sets, however the Advanced Diesel Engine Management control on the Caterpillar engines is more efficient than ignition timing retard.

Included in the Kittery Substation BACT analysis was a review of other diesel units in Maine. Merrill Blueberry, Robbins Lumber, and WPS New England Generation, Inc. all have diesel units and BACT is the limitation of a specific tons per year of NO_x (20 tpy, 22.8 tpy, and 20 tpy).

BACT for NO_x from the Kittery Substation diesel unit is determined to be the use of a Caterpillar unit with the Advanced Diesel Engine Management system, a fuel limit of 136,000 gallons per year, NO_x emission limits of 57.5 lb/hr and 28.8 tons per year, and a license term of one year.

CO – Carbon monoxide forms from an incomplete reaction, occurring when the temperature is too low or the residence time is too short. Catalysts and lean-burn fuel mixtures can be used to control CO. The review of existing facilities showed that add-on controls were usually required for engines that were primary sources of power, not back up or emergency units.

BACT for CO from the Kittery Substation diesel unit is determined to be the use of a Caterpillar unit with the Advanced Diesel Engine Management system, a fuel limit of 136,000 gallons per year, CO emission limits of 1.24 lb/hr and 0.6 tons per year, and a license term of one year.

VOC – Volatile organic compounds are exhausted when fuel remains partially unburned during combustion. This can occur with poor air-to-fuel ratios, incomplete mixing of fuel and air, large fuel droplets, and low cylinder temperatures. Catalysts can be used to control VOC emissions, however the review of existing facilities showed that add-on controls were usually required

for engines that were primary sources of power, not back up or emergency units.

BACT for VOC from the Kittery Substation diesel unit is determined to be the use of a Caterpillar unit with the Advanced Diesel Engine Management system, a fuel limit of 136,000 gallons per year, VOC emission limits of 1.01 lb/hr and 0.5 tons per year, and a license term of one year.

Opacity – The Kittery Substation diesel unit shall meet the opacity requirements in Chapter 101 of the Department’s regulations (Visible Emissions). Visible emissions from the diesel engine shall not exceed an opacity of 20% on a six (6) minute block average basis, except for no more than two (2) six (6) minute block averages in a 3-hour period.

C. Annual Emissions

The Kittery Substation shall be restricted to the following annual emissions from the diesel unit:

Total Licensed Annual Emission for the Facility
Tons/year
 (used to calculate the license fee)

	PM	PM₁₀	SO₂	NO_x	CO	VOC
Diesel Generator	0.2	0.2	0.5	28.8	0.6	0.5

III. AMBIENT AIR QUALITY ANALYSIS

According to Chapter 115 of the Department’s regulations, the level of air quality analyses required for a minor new source shall be determined on a case-by case basis. Based on the information available in the file, the similarity to existing sources, and the licensed tons per year emissions, Maine Ambient Air Quality Standards (MAAQS) will not be violated by this source.

ORDER

Based on the above Findings and subject to conditions listed below, the Department concludes that the emissions from this source:

- will receive Best Practical Treatment,
- will not violate applicable emission standards,
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants Air Emission License A-883-71-A-N subject to the following conditions:

STANDARD CONDITIONS

- (1) Employees and authorized representatives of the Department shall be allowed access to the licensee's premises during business hours, or any time during which any emissions units are in operation, and at such other times as the Department deems necessary for the purpose of performing tests, collecting samples, conducting inspections, or examining and copying records relating to emissions (Title 38 MRSA §347-C).
- (2) The licensee shall acquire a new or amended air emission license prior to commencing construction of a modification, unless specifically provided for in Chapter 115. [MEDEP Chapter 115]
- (3) Approval to construct shall become invalid if the source has not commenced construction within eighteen (18) months after receipt of such approval or if construction is discontinued for a period of eighteen (18) months or more. The Department may extend this time period upon a satisfactory showing that an extension is justified, but may condition such extension upon a review of either the control technology analysis or the ambient air quality standards analysis, or both. [MEDEP Chapter 115]
- (4) The licensee shall establish and maintain a continuing program of best management practices for suppression of fugitive particulate matter during any period of construction, reconstruction, or operation which may result in fugitive dust, and shall submit a description of the program to the Department upon request. [MEDEP Chapter 115]
- (5) The licensee shall pay the annual air emission license fee to the Department, calculated pursuant to Title 38 M.R.S.A. §353. [MEDEP Chapter 115]

- (6) The license does not convey any property rights of any sort, or any exclusive privilege. [MEDEP Chapter 115]
- (7) The licensee shall maintain and operate all emission units and air pollution systems required by the air emission license in a manner consistent with good air pollution control practice for minimizing emissions. [MEDEP Chapter 115]
- (8) The licensee shall maintain sufficient records to accurately document compliance with emission standards and license conditions and shall maintain such records for a minimum of six (6) years. The records shall be submitted to the Department upon written request. [MEDEP Chapter 115]
- (9) The licensee shall comply with all terms and conditions of the air emission license. The filing of an appeal by the licensee, the notification of planned changes or anticipated noncompliance by the licensee, or the filing of an application by the licensee for a renewal of a license or amendment shall not stay any condition of the license. [MEDEP Chapter 115]
- (10) The licensee may not use as a defense in an enforcement action that the disruption, cessation, or reduction of licensed operations would have been necessary in order to maintain compliance with the conditions of the air emission license. [MEDEP Chapter 115]
- (11) In accordance with the Department's air emission compliance test protocol and 40 CFR Part 60 or other method approved or required by the Department, the licensee shall:
 - A. perform stack testing to demonstrate compliance with the applicable emission standards under circumstances representative of the facility's normal process and operating conditions:
 1. within sixty (60) calendar days of receipt of a notification to test from the Department or EPA, if visible emissions, equipment operating parameters, staff inspection, air monitoring or other cause indicate to the Department that equipment may be operating out of compliance with emission standards or license conditions; or
 2. pursuant to any other requirement of this license to perform stack testing.
 - B. install or make provisions to install test ports that meet the criteria of 40 CFR Part 60, Appendix A, and test platforms, if necessary, and other accommodations necessary to allow emission testing; and
 - C. submit a written report to the Department within thirty (30) days from date of test completion.
 [MEDEP Chapter 115]

- (12) If the results of a stack test performed under circumstances representative of the facility's normal process and operating conditions indicate emissions in excess of the applicable standards, then:
- A. within thirty (30) days following receipt of such test results, the licensee shall re-test the non-complying emission source under circumstances representative of the facility's normal process and operating conditions and in accordance with the Department's air emission compliance test protocol and 40 CFR Part 60 or other method approved or required by the Department; and
 - B. the days of violation shall be presumed to include the date of stack test and each and every day of operation thereafter until compliance is demonstrated under normal and representative process and operating conditions, except to the extent that the facility can prove to the satisfaction of the Department that there were intervening days during which no violation occurred or that the violation was not continuing in nature; and
 - C. the licensee may, upon the approval of the Department following the successful demonstration of compliance at alternative load conditions, operate under such alternative load conditions on an interim basis prior to a demonstration of compliance under normal and representative process and operating conditions.
- [MEDEP Chapter 115]
- (13) Notwithstanding any other provisions in the State Implementation Plan approved by the EPA or Section 114(a) of the CAA, any credible evidence may be used for the purpose of establishing whether a person has violated or is in violation of any statute, regulation, or Part 70 license requirement. [MEDEP Chapter 115]
- (14) The licensee shall maintain records of malfunctions, failures, downtime, and any other similar change in operation of air pollution control systems or the emissions unit itself that would affect emission and that is not consistent with the terms and conditions of the air emission license. The licensee shall notify the Department within two (2) days or the next state working day, whichever is later, of such occasions where such changes result in an increase of emissions. The licensee shall report all excess emissions in the units of the applicable emission limitation. [MEDEP Chapter 115]
- (15) Upon written request from the Department, the licensee shall establish and maintain such records, make such reports, install, use and maintain such monitoring equipment, sample such emissions (in accordance with such methods, at such locations, at such intervals, and in such a manner as the Department shall prescribe), and provide other information as the Department may reasonably require to determine the licensee's compliance status. [MEDEP Chapter 115]

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SPECIFIC CONDITIONS

(16) Internal Combustion Diesel Engine

- A. The 19 MMBtu/hr diesel Caterpillar engine shall have an Advanced Diesel Engine Management system as part of the operational controls. [MEDEP Chapter 115, BACT]
- B. The diesel engine shall not exceed the following emission limits [MEDEP Chapter 115, BACT]:

Emission Unit	PM (lb/hr)	PM₁₀ (lb/hr)	SO₂ (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
Diesel Engine	0.47	0.47	0.94	57.5	1.24	1.01

- C. Total fuel use for the diesel engine shall not exceed 136,000 gal/yr of diesel fuel oil with a maximum sulfur content not to exceed 0.05% by weight. Compliance shall be demonstrated by fuel receipts from the supplier showing the quantity of fuel delivered and the percent sulfur of the fuel. Records of annual fuel use shall be kept on a monthly and 12-month total basis. [MEDEP Chapter 115, BACT]
- D. Visible emissions from the diesel engine shall not exceed 20% opacity on a six (6) minute block average basis, except for no more than two (2) six (6) minute block averages in a 3-hour period. [MEDEP Chapter 101]

(17) Malfunction/Breakdown

The licensee shall notify the Department within 48 hours and submit a report to the Department on a quarterly basis if a malfunction or breakdown in any component causes a violation of any emission standard. [Title 38 MRSA §605]

(18) Annual Emission Statement

In accordance with MEDEP Chapter 137 of the Department's regulations, the licensee shall annually report to the Department the information necessary to accurately update the State's emission inventory by means of:

- 1) A computer program and accompanying instructions supplied by the Department;
or
- 2) A written emission statement containing the information required in MEDEP Chapter 137.

Reports and questions should be directed to:

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Attn: Criteria Emission Inventory Coordinator
Maine DEP
Bureau of Air Quality
17 State House Station
Augusta, ME 04333-0017

Phone: (207) 287-2437

The emission statement must be submitted as specified in Chapter 137.

DONE AND DATED IN AUGUSTA, MAINE THIS DAY OF , 2004.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: _____
DAWN R. GALLAGHER, COMMISSIONER

The term of this license shall be one (1) year from the signature date above.

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: February 17, 2004

Date of application acceptance: February 18, 2004

Date filed with the Board of Environmental Protection: _____

This Order prepared by Kathleen E. Molokie, Bureau of Air Quality.